

**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
540 S. MORRIS AVE., MONTGOMERY, AL 36115
GAMMA ANALYSES**

REPORT OF SAMPLE DELIVERY GROUP #1200016

Project: Dimock Residential GW Site, Dimock, PA - Follow-up work
Analysis method: Gamma Spectrometry
Report ID: 1200016-GAMMA
Report type: Original
Date reported: 06/14/2012
Total pages in report: 15

SAMPLES

NAREL Sample #	Client Sample ID	Location	Matrix	Date Collected	Date Received
B2.05495G	FB22	PA:DIMOCK	WATER-DRINKING	05/22/2012	05/23/2012
B2.05496H	HW64	PA:DIMOCK	WATER-DRINKING	05/22/2012	05/23/2012
B2.05497J	FB23	PA:DIMOCK	WATER-DRINKING	05/23/2012	05/24/2012
B2.05498K	HW63Z	PA:DIMOCK	WATER-DRINKING	05/23/2012	05/24/2012
B2.05499L	HW62	PA:DIMOCK	WATER-DRINKING	05/22/2012	05/24/2012
B2.05500K	HW63	PA:DIMOCK	WATER-DRINKING	05/23/2012	05/24/2012

EXCEPTIONS


1. **Packaging and shipping** – No problems were observed.
2. **Documentation** – No problems were observed.
3. **Sample preparation** – No problems were encountered.
4. **Analysis** – NAREL normally assumes that the radon daughter nuclides Pb-214 and Bi-214 in environmental matrices are in equilibrium with Ra-226 and therefore decay corrects the concentrations of those nuclides using the 1,600 year Ra-226 half life. For this project, the results of gross alpha/beta and radium analysis are inconsistent with that assumption, and the observed decay rate between replicate gamma analyses of the same aliquant performed on different days indicates that the parent contaminant is dissolved radon gas rather than Ra-226. Pb-214 and Bi-214 concentrations in water samples for this project were therefore decay corrected to the time of sample collection using the 3.842 day half life of their parent nuclide, Rn-222. Radon is known to slowly escape from plastic sample containers, therefore the actual concentrations at the time of sampling are likely higher than the measured concentrations. As stated earlier, a replicate analysis on the same sample performed at a later time would be expected to result in somewhat lower measured Pb-214 and Bi-214 concentrations than the initial analysis.
5. **Holding times** – No holding times were specified.

QUALITY CONTROL

1. **QC samples** – All QC analysis results met NAREL acceptance criteria.
2. **Instruments** – Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.


CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Director of the Center for Environmental Radioanalytical Laboratory Science and the NAREL Quality Assurance Manager, or their designees, as verified by the following signatures.



Mary F. Wisdom
Quality Assurance Manager, NAREL

6-18-12
Date



Cynthia A. White
Acting Director, Center for Environmental Radioanalytical
Laboratory Science

6-18-12
Date

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Method blank
STD	External standard (used for ^{228}Ra yield determination)

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

RADIOCHEMICAL DATA

Radiochemical analyses usually require the subtraction of an instrument background measurement result from a gross sample measurement result. Both values are positive, but when the sample activity is low, random variations in the two measurements can cause the gross value to be less than the background, resulting in a measured activity less than zero. Although negative activities have no physical significance, they do have statistical importance, as for example in the evaluation of trends or the comparison of two groups of samples.

To the extent practical, it is the policy of NAREL to report results as generated, whether positive, negative, or zero, together with the "2-sigma" measurement uncertainty and a sample-specific estimate of the minimum detectable concentration (MDC). The measurement result, uncertainty, and MDC are always expressed in the same unit of measurement.

EVALUATION OF QC ANALYSES

A method blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores." A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the Z score is computed.

Each standard uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of method blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GAMMA ANALYSIS

The reporting format lists the gamma emitters in alphabetical order. The activity, 2-sigma uncertainty, and a sample-specific estimate of the MDC for radionuclides measured by gamma spectroscopy are reported only if the nuclide is detected above background with the exception of client requested nuclides of interest. The activity for each of the requested nuclides is reported whether negative, positive, or zero along with the associated 2-sigma uncertainty and the sample-specific estimate of the MDC.

Due to potential spectral interferences and other possible problems associated with the determination of the activity of certain radionuclides, the activities for ^{214}Bi , ^{214}Pb , ^{234}Th , $^{234\text{m}}\text{Pa}$, ^{226}Ra , ^{231}Th , and ^{235}U are subject to greater uncertainty than other commonly reported radionuclides. It should be noted that this potential uncertainty is not included in the two-sigma expanded uncertainty that is reported with each result. Although in this report we do provide the calculated activities for these radionuclides, we recommend that the results be used only as a qualitative means of indicating the presence of these radionuclides and not as a quantitative measure of their concentration. The results for these nuclides are not used in the evaluation of quality control samples. Furthermore, because of mutual interference between ^{226}Ra and ^{235}U , NAREL's gamma analysis software tends to overestimate the amounts of these nuclides whenever both are present in a sample. Lower estimates for ^{226}Ra activities can be obtained from the reported activities of its decay products, ^{214}Pb and ^{214}Bi , which are likely to be somewhat less than the ^{226}Ra activity because of the potential escape of radon gas.

NAREL's gamma spectroscopy software corrects activities and MDCs for decay between collection and analysis, but only up to a limit of ten half-lives. So, if the decay time for a sample is more than ten half-lives of a radionuclide, that nuclide will almost always be undetected and the reported MDC will be meaningless. This is usually a problem only for short-lived radionuclides, such as ^{131}I and ^{140}Ba , when there is a long delay between collection and analysis.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200016

ANALYSIS SUMMARY

Analysis method: NAREL GAM-01
Title: Gamma Spectrometry

NAREL Sample #	Client Sample ID	QC Type	Date Completed	Preparation Batch #	Assay Batch #
B2.05495G	FB22		05/25/2012	0008778X	0016000G
B2.05496H	HW64		05/24/2012	0008778X	0016000G
B2.05497J	FB23		05/26/2012	0008778X	0016000G
B2.05498K	HW63Z		05/25/2012	0008778X	0016000G
B2.05499L	HW62		05/25/2012	0008778X	0016000G
B2.05499L	HW62	DUP	05/26/2012	0008778X	0016000G
B2.05500K	HW63		05/25/2012	0008778X	0016000G
LCS-00638967Q *		LCS	05/26/2012	0008778X	0016000G
RBK-00638966P *		RBK	05/24/2012	0008778X	0016000G

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200016

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.05495G	Amount analyzed:	3.000e+00 L
Client sample ID:	FB22	Preparation batch #:	0008778X
Matrix:	WATER-DRINKING	Assay batch #:	0016000G
Collected:	2012-05-22 11:58 EDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
05/25/2012 14:15	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Bi212	1.93e+00	1.1e+01	1.9e+01	PCI/L	05/22/2012 11:58 EDT
Bi214 J	2.79e+00	3.8e+00	6.6e+00	PCI/L	05/22/2012 11:58 EDT
K40	8.17e+00	1.1e+01	1.6e+01	PCI/L	05/22/2012 11:58 EDT
Pb214 J	3.63e+00	4.5e+00	6.6e+00	PCI/L	05/22/2012 11:58 EDT
Ra226 J	2.95e+00	2.9e+01	5.0e+01	PCI/L	05/22/2012 11:58 EDT
Ra228	6.42e-01	3.1e+00	5.7e+00	PCI/L	05/22/2012 11:58 EDT
Th234 J	4.57e+01	1.2e+02	2.0e+02	PCI/L	05/22/2012 11:58 EDT
U235 J	4.08e+00	1.0e+01	1.7e+01	PCI/L	05/22/2012 11:58 EDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200016

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.05496H	Amount analyzed:	3.000e+00 L
Client sample ID:	HW64	Preparation batch #:	0008778X
Matrix:	WATER-DRINKING	Assay batch #:	0016000G
Collected:	2012-05-22 11:10 EDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
05/24/2012 17:18	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Bi212	6.25e+00	1.4e+01	2.4e+01	PCI/L	05/22/2012 11:10 EDT
Bi214 J	1.43e+02	1.7e+01	5.6e+00	PCI/L	05/22/2012 11:10 EDT
K40	8.43e+00	1.3e+01	1.8e+01	PCI/L	05/22/2012 11:10 EDT
Pb214 J	1.62e+02	1.9e+01	6.7e+00	PCI/L	05/22/2012 11:10 EDT
Ra226 J	1.45e+00	3.6e+01	6.0e+01	PCI/L	05/22/2012 11:10 EDT
Ra228	9.79e-01	3.7e+00	6.7e+00	PCI/L	05/22/2012 11:10 EDT
Th234 J	-2.33e+01	1.4e+02	2.4e+02	PCI/L	05/22/2012 11:10 EDT
U235 J	1.60e+00	1.3e+01	2.2e+01	PCI/L	05/22/2012 11:10 EDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200016

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.05497J	Amount analyzed:	3.000e+00 L
Client sample ID:	FB23	Preparation batch #:	0008778X
Matrix:	WATER-DRINKING	Assay batch #:	0016000G
Collected:	2012-05-23 13:25 EDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
05/25/2012 19:17	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Bi212	1.46e+00	1.3e+01	2.1e+01	PCI/L	05/23/2012 13:25 EDT
Bi214 J	1.64e+00	3.1e+00	5.5e+00	PCI/L	05/23/2012 13:25 EDT
K40	6.62e+00	9.4e+00	1.6e+01	PCI/L	05/23/2012 13:25 EDT
Pb214 J	4.35e+00	3.7e+00	5.3e+00	PCI/L	05/23/2012 13:25 EDT
Ra226 J	-2.17e+00	3.3e+01	4.9e+01	PCI/L	05/23/2012 13:25 EDT
Ra228	-1.56e+00	5.2e+00	5.7e+00	PCI/L	05/23/2012 13:25 EDT
Th234 J	1.53e+01	1.0e+02	1.7e+02	PCI/L	05/23/2012 13:25 EDT
U235 J	-3.05e+00	1.1e+01	1.8e+01	PCI/L	05/23/2012 13:25 EDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200016

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.05498K	Amount analyzed:	3.000e+00 L
Client sample ID:	HW63Z	Preparation batch #:	0008778X
Matrix:	WATER-DRINKING	Assay batch #:	0016000G
Collected:	2012-05-23 13:10 EDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
05/24/2012 22:19	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Bi212	-6.64e+00	2.6e+01	4.3e+01	PCI/L	05/23/2012 13:10 EDT
Bi214 J	1.45e+03	1.6e+02	8.3e+00	PCI/L	05/23/2012 13:10 EDT
K40	-1.26e+01	5.0e+01	3.3e+01	PCI/L	05/23/2012 13:10 EDT
Pb214 J	1.61e+03	1.8e+02	1.4e+01	PCI/L	05/23/2012 13:10 EDT
Ra226 J	-1.25e+01	1.9e+02	1.3e+02	PCI/L	05/23/2012 13:10 EDT
Ra228	-7.29e-02	7.8e+00	1.3e+01	PCI/L	05/23/2012 13:10 EDT
Th234 J	-2.23e+02	2.9e+02	4.8e+02	PCI/L	05/23/2012 13:10 EDT
U235 J	-1.34e+01	2.9e+01	4.7e+01	PCI/L	05/23/2012 13:10 EDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200016

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.05499L	Amount analyzed:	3.000e+00 L
Client sample ID:	HW62	Preparation batch #:	0008778X
Matrix:	WATER-DRINKING	Assay batch #:	0016000G
Collected:	2012-05-22 15:59 EDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
05/25/2012 03:22	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Bi212	-4.18e-01	1.6e+01	2.7e+01	PCI/L	05/22/2012 15:59 EDT
Bi214 J	2.87e+02	3.2e+01	6.4e+00	PCI/L	05/22/2012 15:59 EDT
K40	1.42e+01	1.5e+01	2.0e+01	PCI/L	05/22/2012 15:59 EDT
Pb214 J	3.13e+02	3.6e+01	9.2e+00	PCI/L	05/22/2012 15:59 EDT
Ra226 J	3.73e+00	4.1e+01	6.8e+01	PCI/L	05/22/2012 15:59 EDT
Ra228	-2.45e+00	1.0e+01	7.6e+00	PCI/L	05/22/2012 15:59 EDT
Th234 J	-7.91e+00	1.6e+02	2.6e+02	PCI/L	05/22/2012 15:59 EDT
U235 J	1.26e-01	1.5e+01	2.5e+01	PCI/L	05/22/2012 15:59 EDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200016

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.05499L	Amount analyzed:	3.000e+00 L
Client sample ID:	HW62	Preparation batch #:	0008778X
Matrix:	WATER-DRINKING	Assay batch #:	0016000G
Collected:	2012-05-22 15:59 EDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	DUP
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
05/25/2012 14:16	1000.0	GE16	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Bi212	2.24e+00	1.0e+01	1.7e+01	PCI/L	05/22/2012 15:59 EDT
Bi214 J	2.61e+02	2.9e+01	4.5e+00	PCI/L	05/22/2012 15:59 EDT
K40	-6.27e+00	1.8e+01	1.4e+01	PCI/L	05/22/2012 15:59 EDT
Pb214 J	2.85e+02	3.2e+01	5.9e+00	PCI/L	05/22/2012 15:59 EDT
Ra226 J	-1.61e+01	1.5e+02	3.6e+01	PCI/L	05/22/2012 15:59 EDT
Ra228	-4.59e-01	2.1e+00	3.6e+00	PCI/L	05/22/2012 15:59 EDT
Th234 J	-1.96e+01	2.8e+01	4.6e+01	PCI/L	05/22/2012 15:59 EDT
U235 J	-2.71e+00	6.9e+00	1.1e+01	PCI/L	05/22/2012 15:59 EDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200016

SAMPLE ANALYSIS REPORT

Lab sample #:	B2.05500K	Amount analyzed:	3.000e+00 L
Client sample ID:	HW63	Preparation batch #:	0008778X
Matrix:	WATER-DRINKING	Assay batch #:	0016000G
Collected:	2012-05-23 13:09 EDT	Prep procedure:	N/A
Sample type:	SAM	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
05/24/2012 12:09	1000.0	GE16	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Bi212	9.65e-01	2.0e+01	3.3e+01	PCI/L	05/23/2012 13:09 EDT
Bi214 J	1.52e+03	1.6e+02	5.0e+00	PCI/L	05/23/2012 13:09 EDT
K40	-5.70e+00	3.0e+01	2.5e+01	PCI/L	05/23/2012 13:09 EDT
Pb214 J	1.53e+03	1.7e+02	7.0e+00	PCI/L	05/23/2012 13:09 EDT
Ra226 J	-7.92e+00	9.8e+01	7.5e+01	PCI/L	05/23/2012 13:09 EDT
Ra228	-8.85e-01	5.7e+00	9.5e+00	PCI/L	05/23/2012 13:09 EDT
Th234 J	-5.60e+01	6.3e+01	1.0e+02	PCI/L	05/23/2012 13:09 EDT
U235 J	4.07e-02	1.5e+01	2.5e+01	PCI/L	05/23/2012 13:09 EDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200016

SAMPLE ANALYSIS REPORT

Lab sample #:	LCS-00638967Q	Amount analyzed:	1.000e+00 SAMP
Client sample ID:	N/A	Preparation batch #:	0008778X
Matrix:	N/A	Assay batch #:	0016000G
Collected:	N/A	Prep procedure:	N/A
Sample type:	N/A	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	LCS
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
05/26/2012 00:19	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Bi207	3.61e+03	3.9e+02	1.1e+01	PCI	12/15/2011 11:00 CDT
Bi212	3.47e+00	8.9e+01	1.5e+02	PCI	12/15/2011 11:00 CDT
Bi214 J	2.94e+00	1.2e+01	2.0e+01	PCI	12/15/2011 11:00 CDT
Eu155	7.57e+02	1.0e+02	7.5e+01	PCI	12/15/2011 11:00 CDT
K40	1.43e+02	7.3e+01	7.8e+01	PCI	12/15/2011 11:00 CDT
Pb214 J	-7.49e+00	1.4e+03	3.5e+01	PCI	12/15/2011 11:00 CDT
Ra226 J	-1.39e+01	3.0e+02	3.7e+02	PCI	12/15/2011 11:00 CDT
Ra228	7.31e+00	2.5e+01	4.2e+01	PCI	12/15/2011 11:00 CDT
Th234 J	-5.40e+01	1.1e+03	1.8e+03	PCI	12/15/2011 11:00 CDT
U235 J	4.06e+00	7.4e+01	1.2e+02	PCI	12/15/2011 11:00 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG #1200016

SAMPLE ANALYSIS REPORT

Lab sample #:	RBK-00638966P	Amount analyzed:	1.000e+00 SAMP
Client sample ID:	N/A	Preparation batch #:	0008778X
Matrix:	N/A	Assay batch #:	0016000G
Collected:	N/A	Prep procedure:	N/A
Sample type:	N/A	Analysis method:	NAREL GAM-01
Dry/wet weight:	N/A	Analyst:	MO
Ash/dry weight:	N/A	QC type:	RBK
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
05/24/2012 12:08	300.0	GE14	MO

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Reference Date
Bi212	4.03e-01	3.5e+01	6.0e+01	PCI	05/24/2012 07:00 CDT
Bi214 J	4.75e+01	1.1e+01	1.2e+01	PCI	05/24/2012 07:00 CDT
K40	-8.50e+00	3.0e+01	5.2e+01	PCI	05/24/2012 07:00 CDT
Pb212	6.49e+00	7.1e+00	1.0e+01	PCI	05/24/2012 07:00 CDT
Pb214 J	3.11e+01	8.5e+00	1.1e+01	PCI	05/24/2012 07:00 CDT
Ra226 J	-1.31e+00	8.8e+01	1.5e+02	PCI	05/24/2012 07:00 CDT
Ra228	8.81e+00	1.1e+01	1.6e+01	PCI	05/24/2012 07:00 CDT
Th234 J	1.03e+02	2.8e+02	4.6e+02	PCI	05/24/2012 07:00 CDT
U235 J	8.06e-01	2.8e+01	4.7e+01	PCI	05/24/2012 07:00 CDT

Note: A "J" qualifier indicates a result that may be significantly under or overestimated.

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG 1200016

PREPARATION BATCH SUMMARY

Preparation batch #: 0008778X
Analysis method: NAREL GAM-01
Preparation procedure: N/A

NAREL Sample #	Client Sample ID	Analysis #	QC Type	Yield	$\pm 2 \sigma$ Uncertainty	Analyst
B2.05495G	FB22	00638935G		N/A		MO
B2.05496H	HW64	00638941E		N/A		MO
B2.05497J	FB23	00638947L		N/A		MO
B2.05498K	HW63Z	00638968R		N/A		MO
B2.05499L	HW62	00638953J		N/A		MO
B2.05499L	HW62	00639059Q	DUP	N/A		MO
B2.05500K	HW63	00638959Q		N/A		MO
LCS-00638967Q *		00638967Q	LCS	N/A		MO
RBK-00638966P *		00638966P	RBK	N/A		MO

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

QC RESULTS FOR BATCH 0008778X

NAREL Sample #	Analysis #	QC Type	Analyte	%R	RPD	Z	Evaluation
B2.05499L	00639059Q	DUP	BI212		291.5	0.28	PASS
B2.05499L	00639059Q	DUP	BI214		9.6	-1.21	PASS-J
B2.05499L	00639059Q	DUP	K40		516.4	-1.76	PASS
B2.05499L	00639059Q	DUP	PB214		9.4	-1.18	PASS-J
B2.05499L	00639059Q	DUP	RA226		-320.6	-0.26	PASS-J
B2.05499L	00639059Q	DUP	RA228		-136.8	0.37	PASS
B2.05499L	00639059Q	DUP	TH234		-85.2	-0.15	PASS-J
B2.05499L	00639059Q	DUP	U235		-219.5	-0.34	PASS-J
LCS-00638967Q	00638967Q	LCS	BI207	93.4		-1.22	PASS
LCS-00638967Q	00638967Q	LCS	EU155	101.6		0.21	PASS
RBK-00638966P	00638966P	RBK	BI212				PASS
RBK-00638966P	00638966P	RBK	BI214				HIGH-J
RBK-00638966P	00638966P	RBK	K40				PASS
RBK-00638966P	00638966P	RBK	PB212				PASS
RBK-00638966P	00638966P	RBK	PB214				HIGH-J
RBK-00638966P	00638966P	RBK	RA226				PASS-J
RBK-00638966P	00638966P	RBK	RA228				PASS
RBK-00638966P	00638966P	RBK	TH234				PASS-J
RBK-00638966P	00638966P	RBK	U235				PASS-J

Note: Results qualified with -J may be significantly under or over-estimated and are not evaluated for QC purposes.